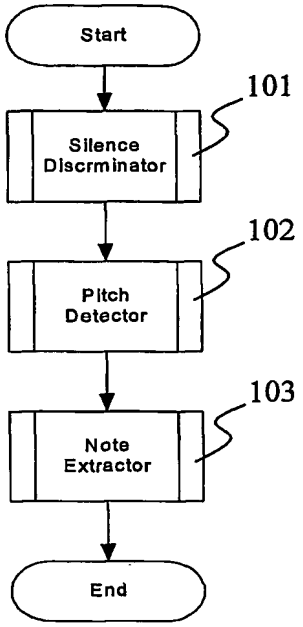
Figure 1



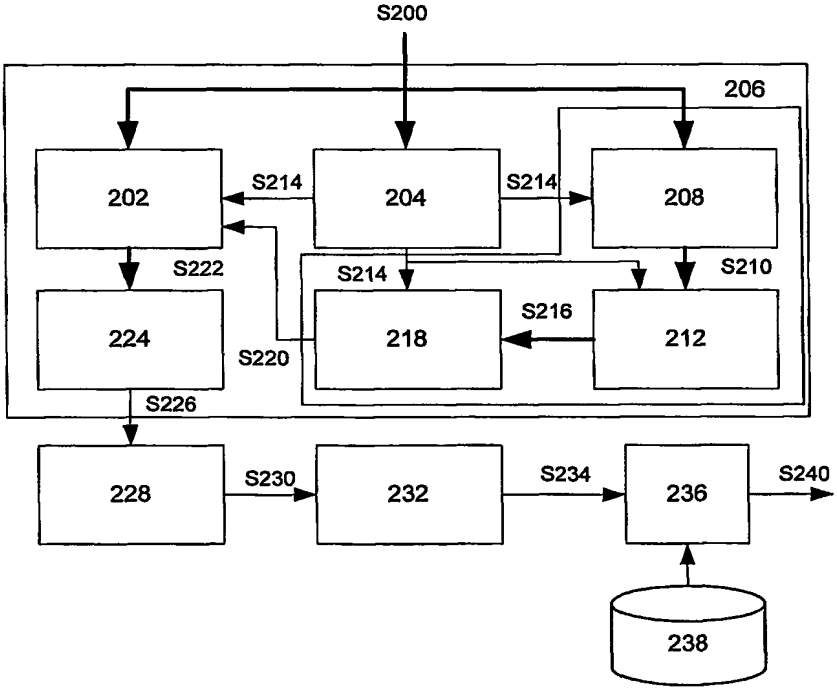


Figure 2

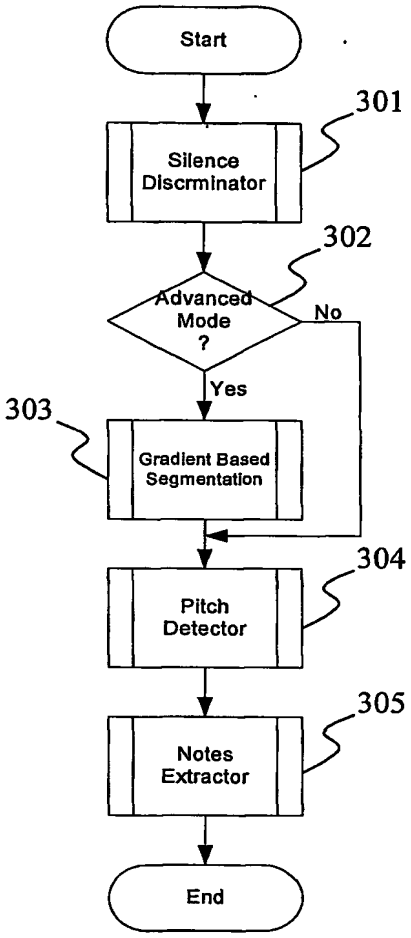

Start
301
Silence Discrminator
302
Advanced Mode ?
No
Yes
303
Gradient Based Segmentation
304
Pitch Detector
305
Notes Extractor
End

Figure 3

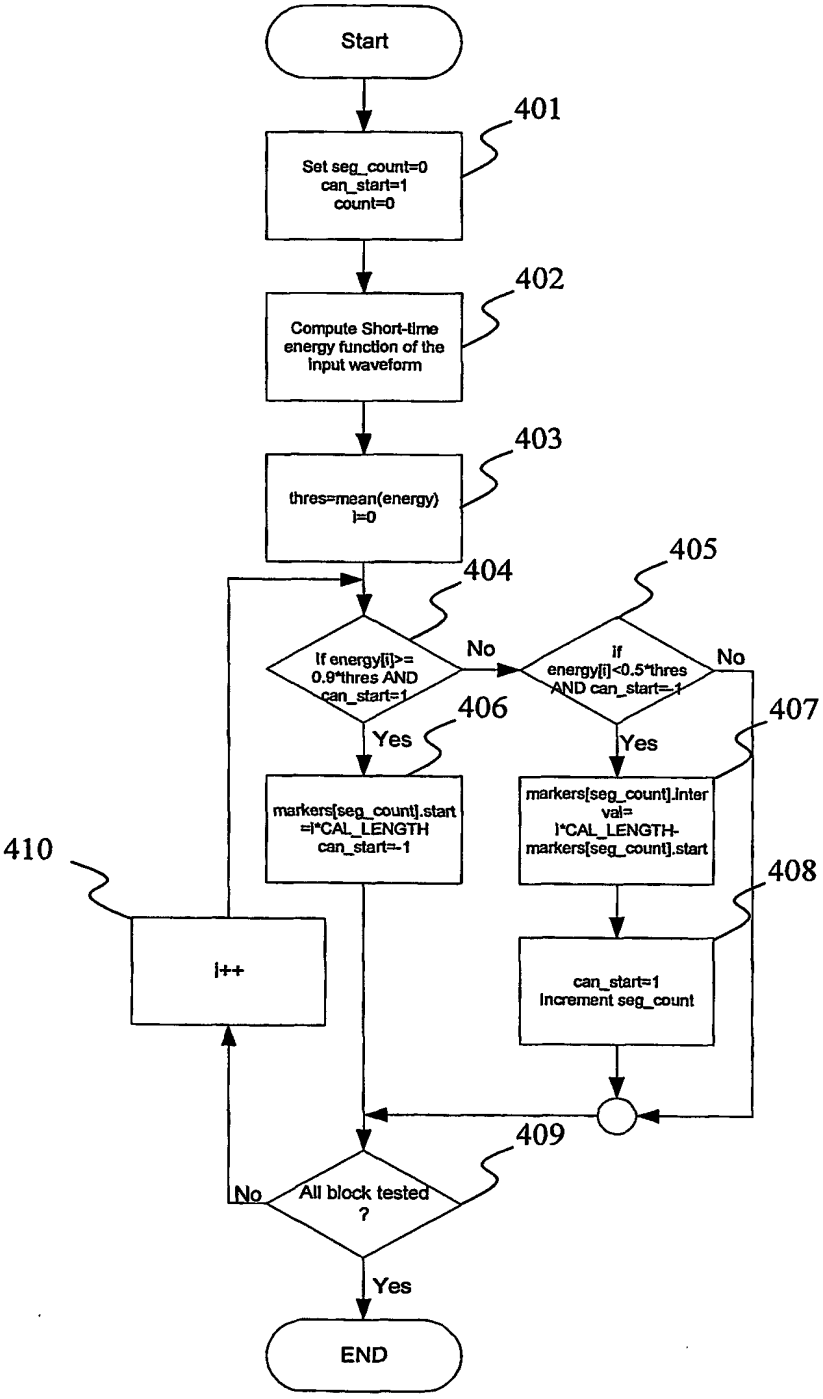

Start
401
Set seg_count=0
can_start=1
count=0
402
Compute Short-time energy function of the input waveform
403
thres=mean(energy)
i=0
404
405
If energy[i]>= 0.9*thres AND can_start=1
No
If energy[i]<0.5*thres AND can_start=-1
No
Yes
406
Yes
407
markers[seg_count].start =i*CAL_LENGTH
can_start=-1
markers[seg_count].Interval= i*CAL_LENGTH-markers[seg_count].start
408
410
i++
can_start=1
Increment seg_count
409
No
All block tested ?
Yes
END

Figure 4

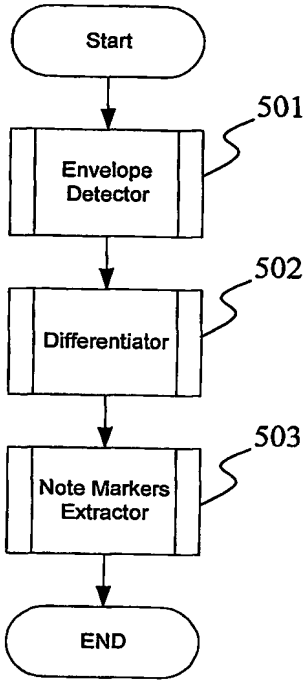

Start
501
Envelope Detector
502
Differentiator
503
Note Markers Extractor
END

Figure 5A

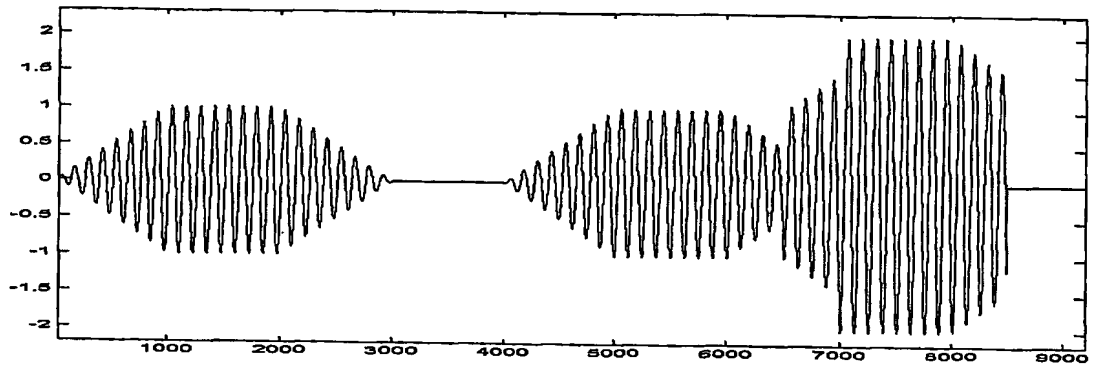


Figure 5B

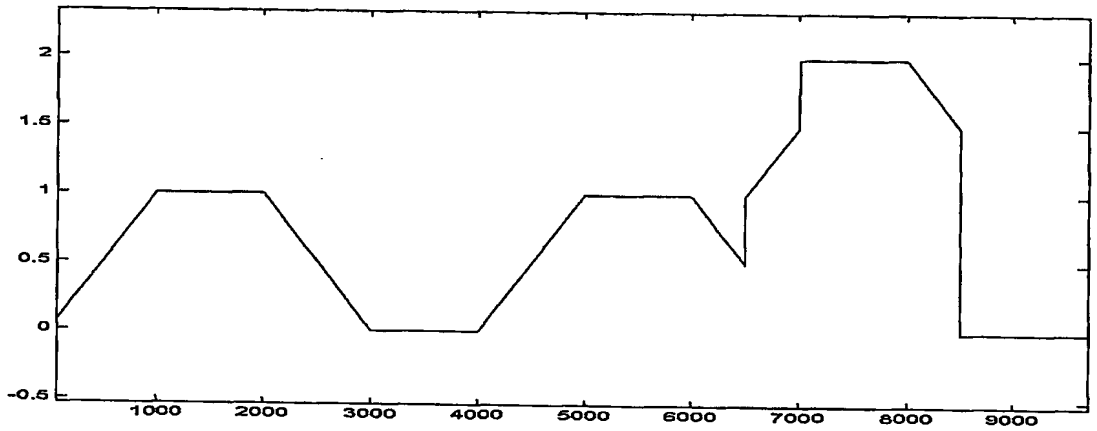


Figure 5C

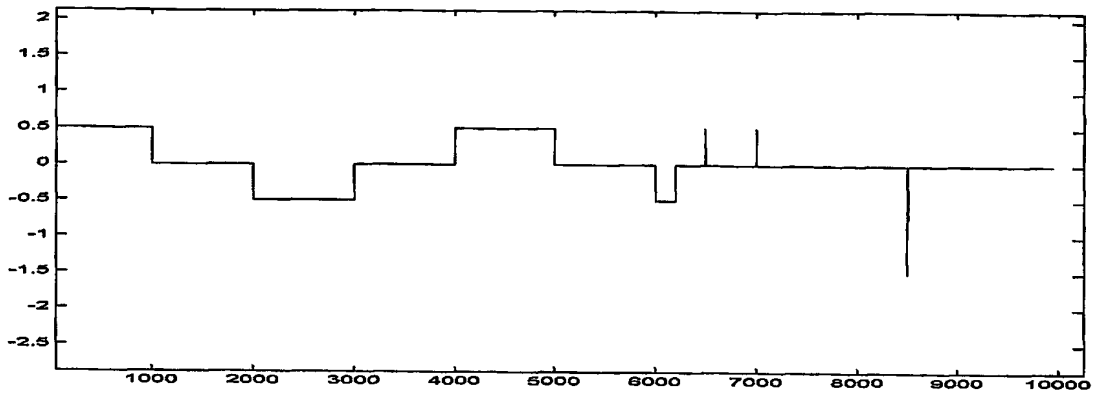


Figure 5D

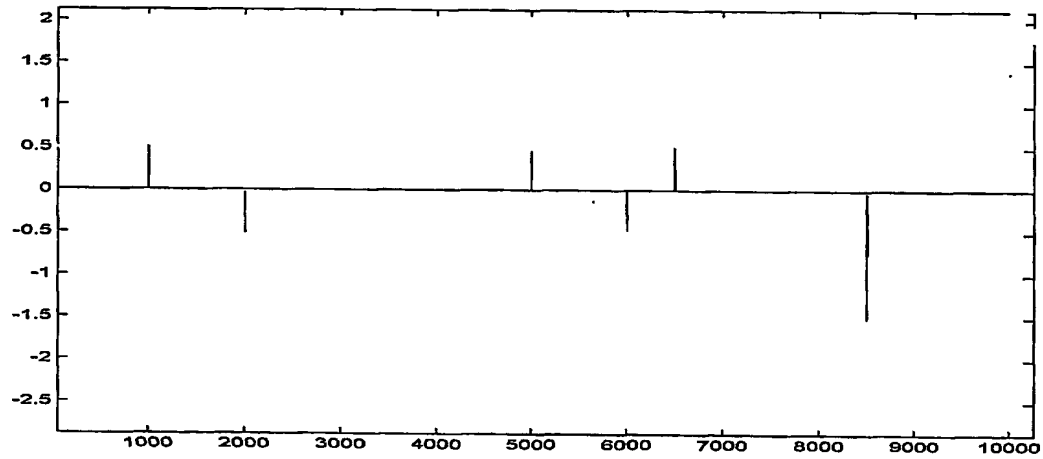


Figure 5E

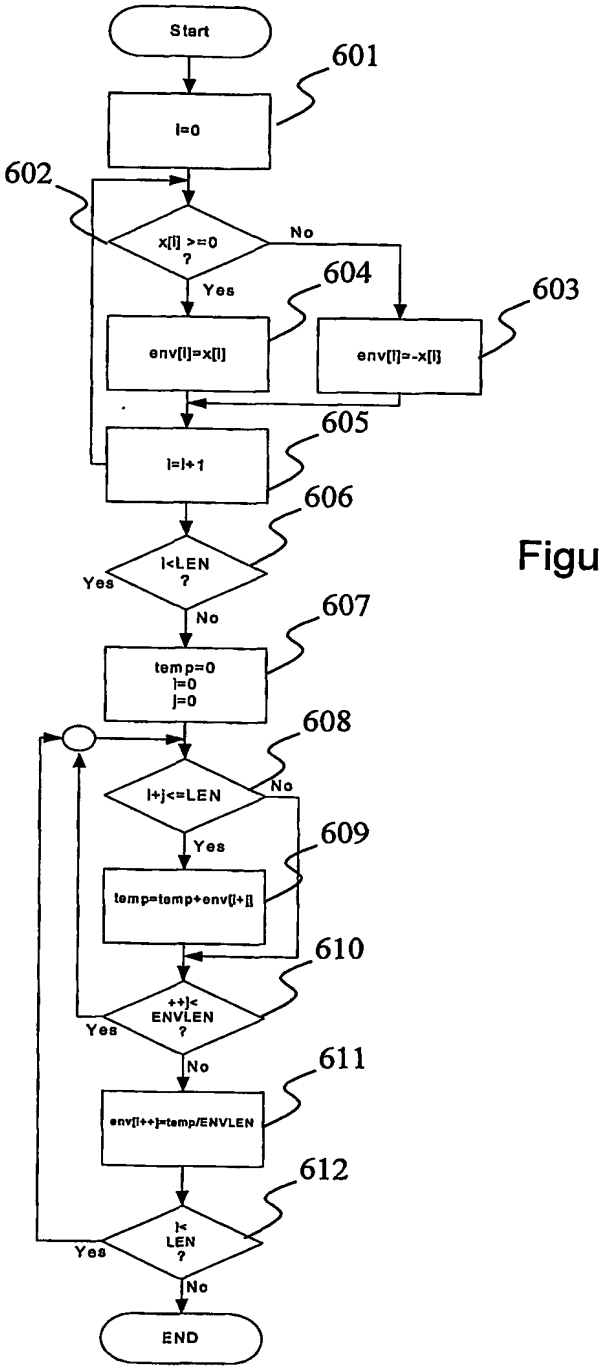

Start
601
i=0
602
x[i] >=0 ?
No
Yes
604
603
env[i]=x[i]
env[i]=-x[i]
605
i=i+1
606
i<LEN ?
Yes
No
607
temp=0
i=0
j=0
608
i+j<=LEN
No
Yes
609
temp=temp+env[i+j]
610
++j< ENVLEN ?
Yes
No
611
env[i++]=temp/ENVLEN
612
i< LEN ?
Yes
No
END

Figure 6

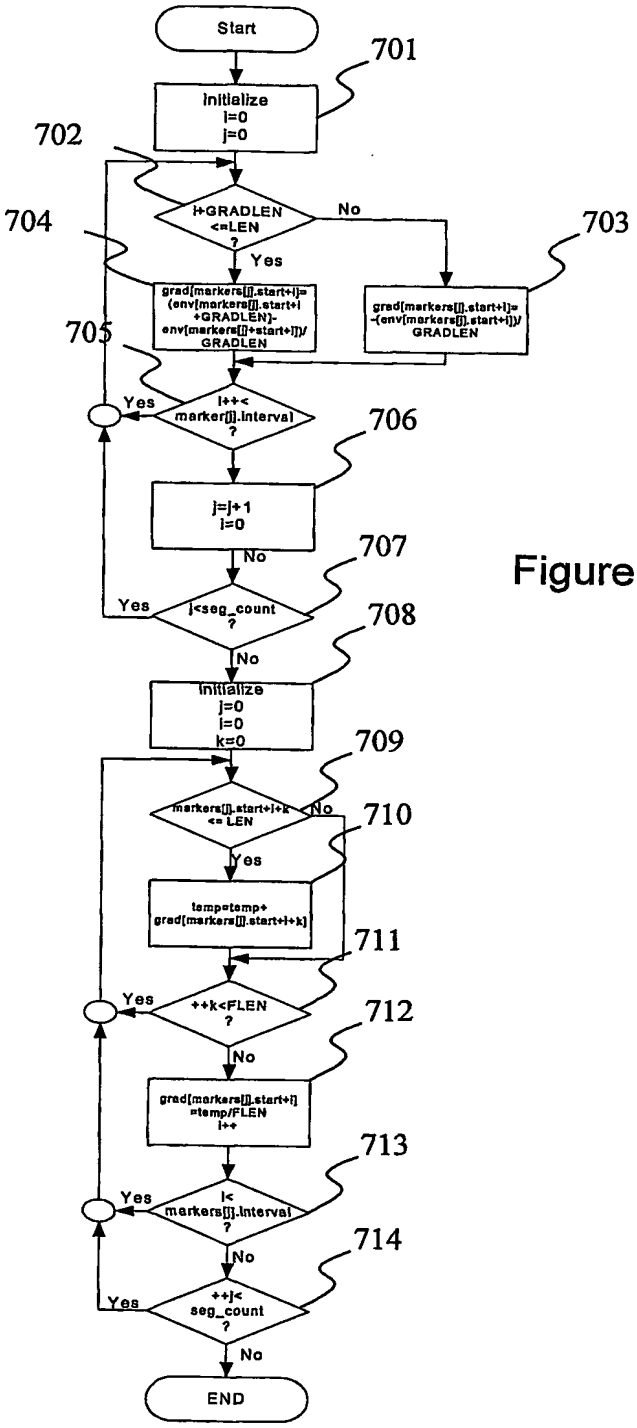

Start
701
Initialize
i=0
j=0
702
i+GRADLEN
<=LEN
?
No
Yes
704
703
grad[markers[j].start+i]=
(env[markers[j].start+i
+GRADLEN]-
env[markers[j]+start+i])/
GRADLEN
grad[markers[j].start+i]=
-(env[markers[j].start+i])/
GRADLEN
705
i++<
marker[j].interval
?
Yes
706
j=j+1
i=0
No
707
j<seg_count
?
Yes
708
No
initialize
j=0
i=0
k=0
709
markers[j].start+i+k
<= LEN
No
710
Yes
temp=temp+
grad[markers[j].start+i+k]
711
++k<FLEN
?
Yes
712
No
grad[markers[j].start+i]
=temp/FLEN
i++
713
i<
markers[j].interval
?
Yes
No
714
++j<
seg_count
?
Yes
No
END

Figure 7

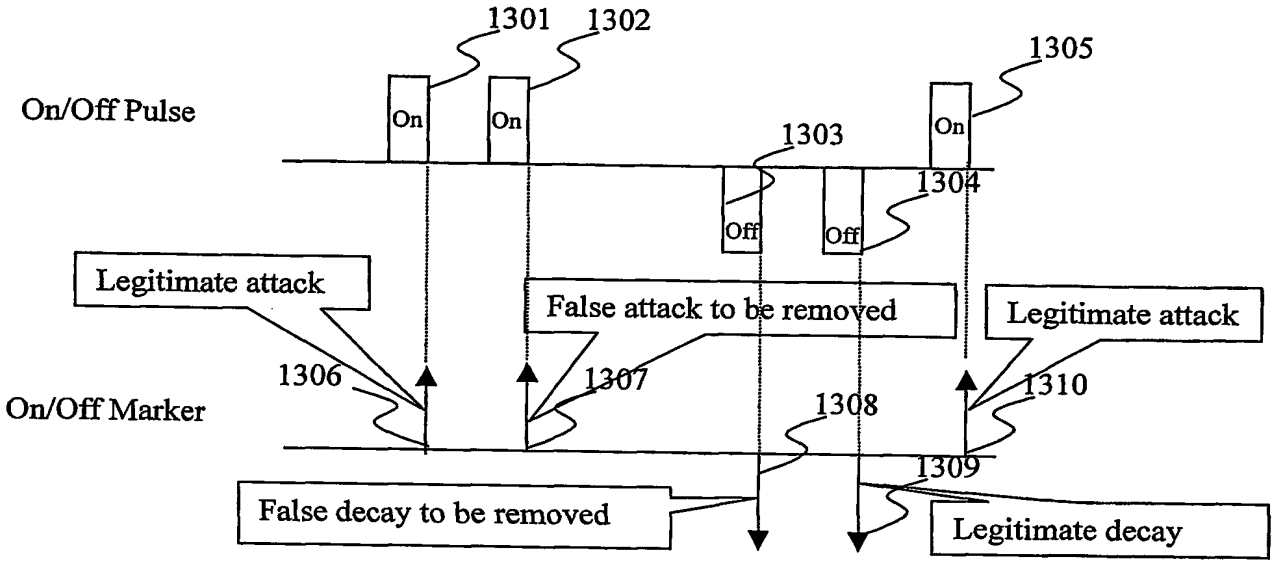

1301
1302
1305
On/Off Pulse
On
On
On
1303
1304
Off
Off
Legitimate attack
False attack to be removed
Legitimate attack
1306
1307
1310
On/Off Marker
1308
1309
False decay to be removed
Legitimate decay

Figure 8

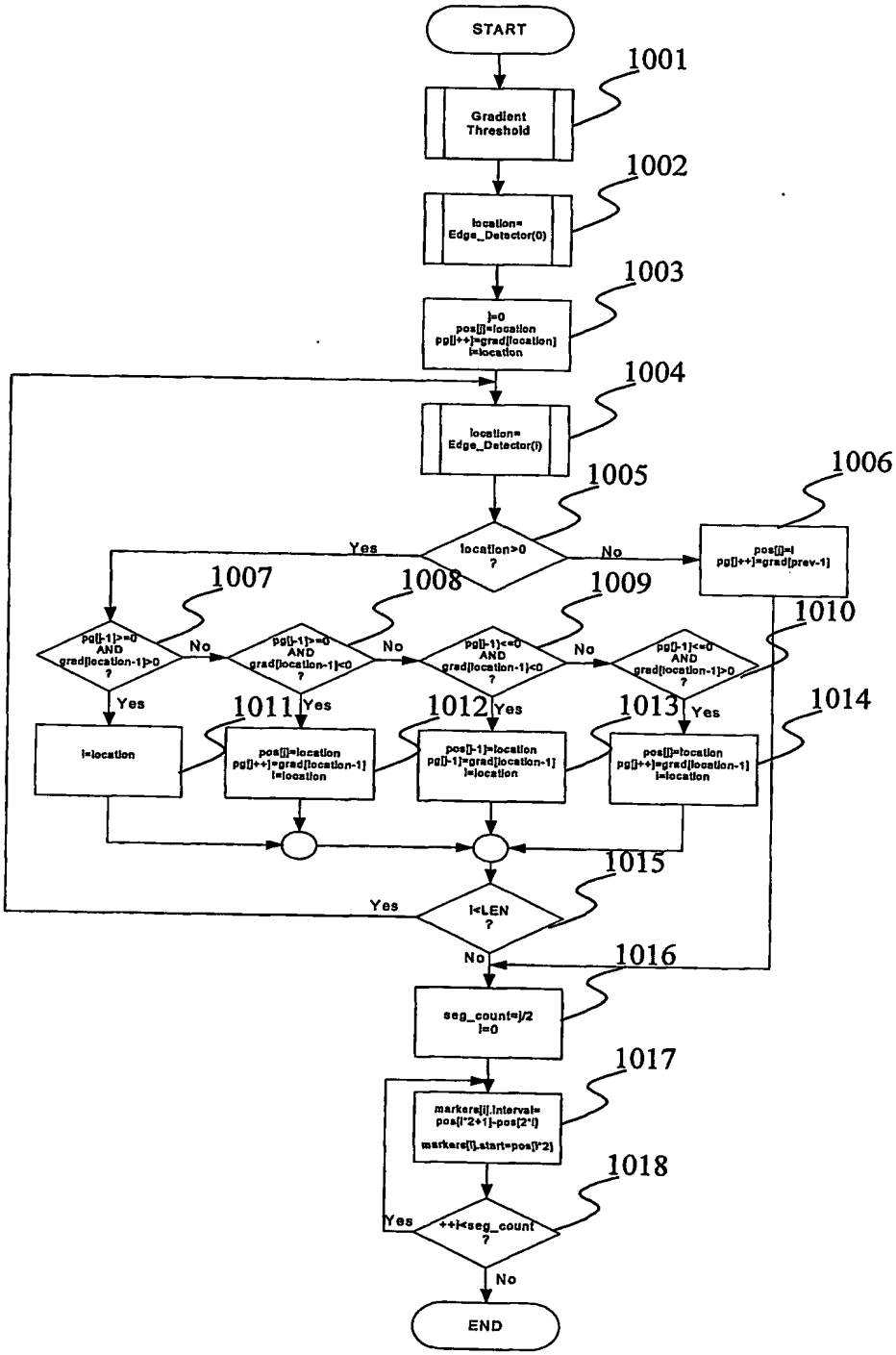

START
1001
Gradient Threshold
1002
location= Edge_Detector(0)
1003
i=0
pos[i]=location
pg[i++]=grad[location]
i=location
1004
location= Edge_Detector(i)
1005
location>0 ?
Yes
No
1006
pos[i]=i
pg[i++]=grad[prev-1]
1007
pg[i-1]>=0 AND grad[location-1]>0 ?
No
1008
pg[i-1]>=0 AND grad[location-1]<0 ?
No
1009
pg[i-1]<=0 AND grad[location-1]<0 ?
No
1010
pg[i-1]<=0 AND grad[location-1]>0 ?
Yes
1011
Yes
1012
Yes
1013
Yes
1014
i=location
pos[i]=location
pg[i++]=grad[location-1]
i=location
pos[i-1]=location
pg[i-1]=grad[location-1]
i=location
pos[i]=location
pg[i++]=grad[location-1]
i=location
1015
I<LEN ?
Yes
No
1016
seg_count=j/2
i=0
1017
markers[i].interval= pos[i*2+1]-pos[2*i]
markers[i].start=pos[i*2]
1018
++i<seg_count ?
Yes
No
END

Figure 9

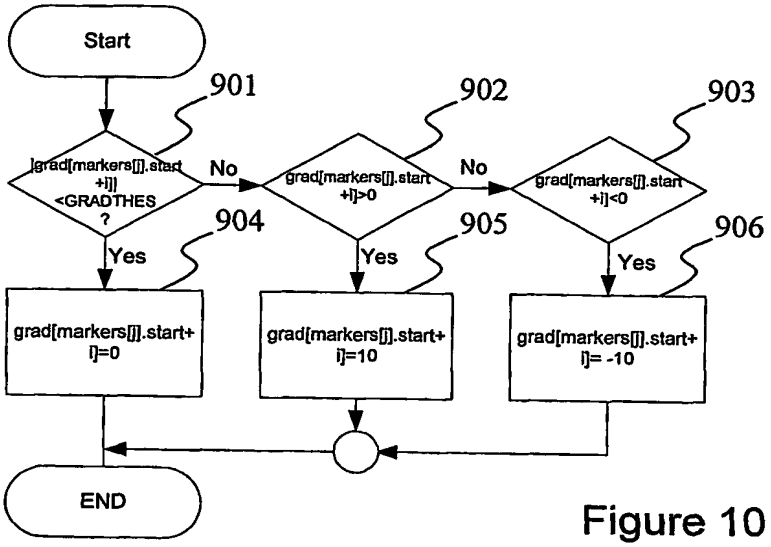
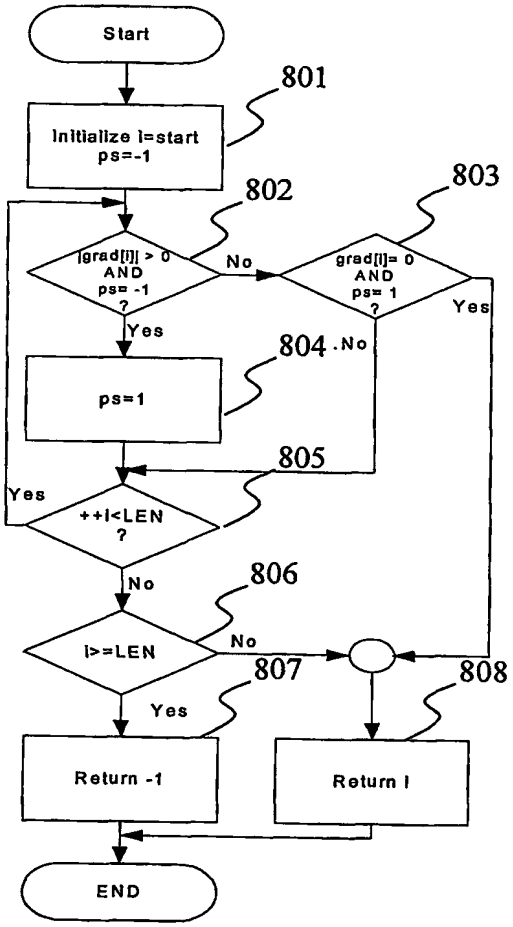


Figure 10

Figure 11



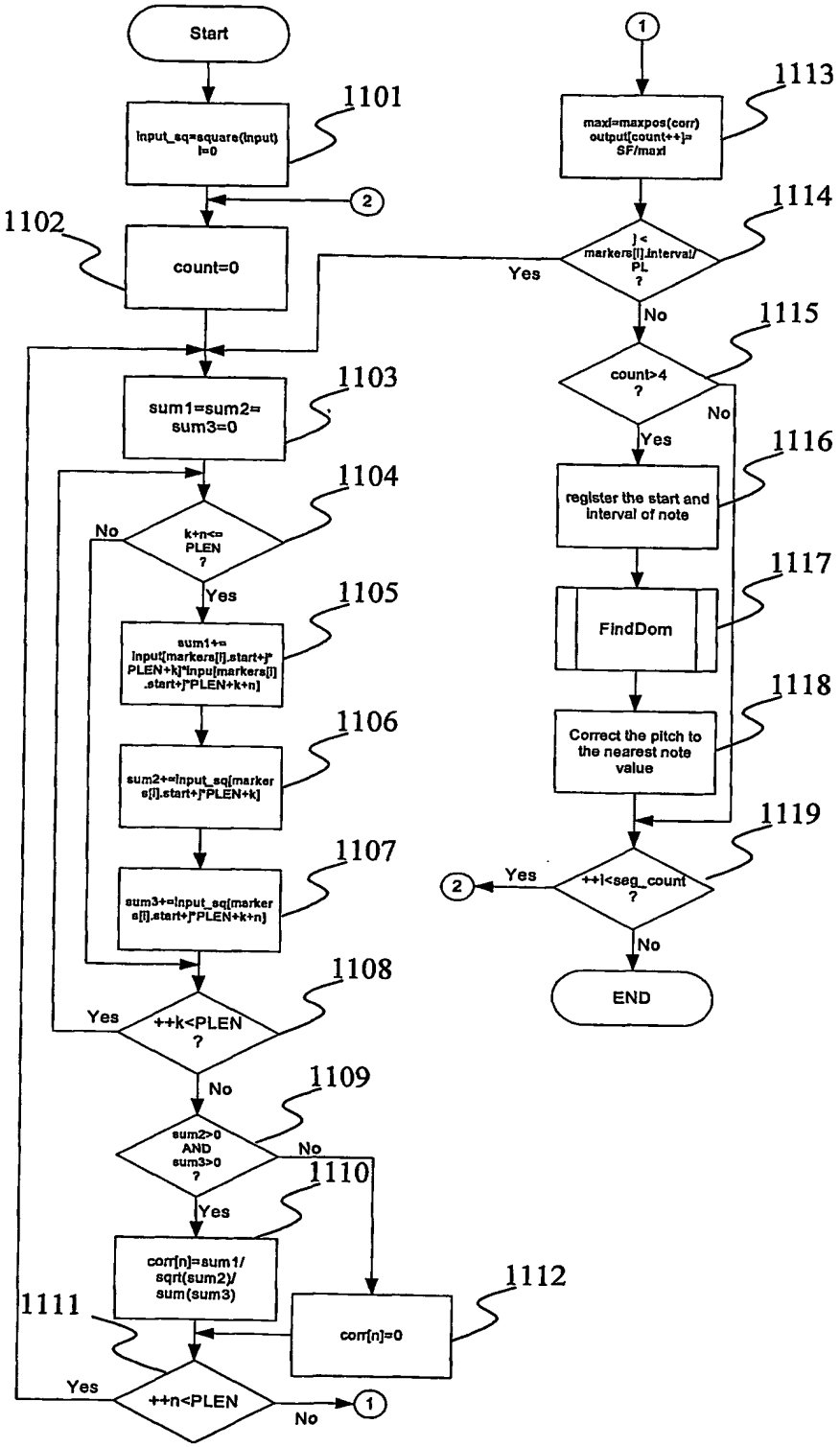
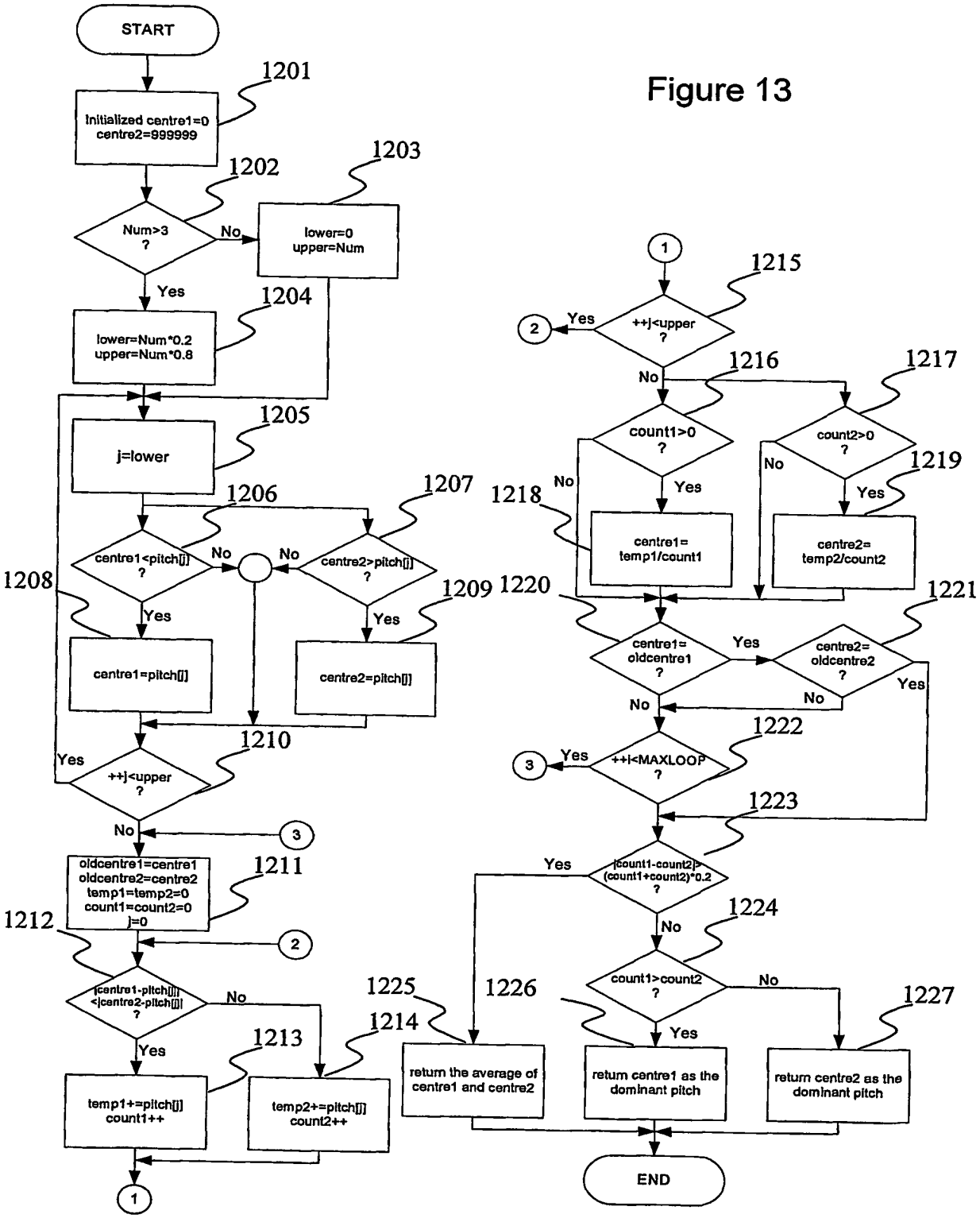

Start
Input_sq=square(input)
i=0
1101
2
1102
count=0
sum1=sum2=
sum3=0
1103
1104
k+n<=
PLEN
?
No
Yes
1105
sum1+=
input[markers[i].start+j*
PLEN+k]*input[markers[i]
.start+j*PLEN+k+n]
1106
sum2+=input_sq[marker
s[i].start+j*PLEN+k]
1107
sum3+=input_sq[marker
s[i].start+j*PLEN+k+n]
1108
++k<PLEN
?
Yes
No
1109
sum2>0
AND
sum3>0
?
No
Yes
1110
corr[n]=sum1/
sqrt(sum2)/
sum(sum3)
1111
corr[n]=0
1112
++n<PLEN
?
Yes
No
1
1113
maxi=maxpos(corr)
output[count++]=
SF/maxi
1114
i <
markers[i].interval/
PL
?
Yes
No
1115
count>4
?
No
Yes
1116
register the start and
interval of note
1117
FindDom
1118
Correct the pitch to
the nearest note
value
1119
++i<seg_count
?
Yes
No
2
END

Figure 12

Figure 13


START
1201
Initialized centre1=0
centre2=999999
1202
Num>3
?
No
1203
lower=0
upper=Num
Yes
1204
lower=Num*0.2
upper=Num*0.8
1205
j=lower
1206
centre1<pitch[j]
?
No
1207
centre2>pitch[j]
?
No
1208
Yes
centre1=pitch[j]
1209
Yes
centre2=pitch[j]
1210
Yes
++j<upper
?
No
3
1211
oldcentre1=centre1
oldcentre2=centre2
temp1=temp2=0
count1=count2=0
j=0
1212
2
|centre1-pitch[j]|
<|centre2-pitch[j]|
?
No
Yes
1213
temp1+=pitch[j]
count1++
1214
temp2+=pitch[j]
count2++
1
1
1215
2
Yes
++j<upper
?
No
1216
count1>0
?
No
Yes
1217
count2>0
?
No
Yes
1218
centre1=
temp1/count1
1219
centre2=
temp2/count2
1220
centre1=
oldcentre1
?
Yes
1221
centre2=
oldcentre2
?
Yes
No
No
1222
3
Yes
++j<MAXLOOP
?
1223
Yes
|count1-count2|>
(count1+count2)*0.2
?
No
1224
count1>count2
?
No
Yes
1225
return the average of
centre1 and centre2
1226
return centre1 as the
dominant pitch
1227
return centre2 as the
dominant pitch
END